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(54) Title: METHOD AND COMPOSITIONS FOR DISINFECTING HARD SURFACES

(57) Abstract: There is disclosed an aqueous composition of alcohol having a weight percent of alcohol of from about 40 to about 70 with the solution have a pH of from about 7.0 to about 13.0 for the treatment of non-porous hard surfaces. In addition, there is disclosed a method for sanitizing and/or disinfecting a hard surface comprising the step of treating the surface with an aqueous solution of alcohol having a weight percent of alcohol of from about 40 to about 70 with the solution have a pH of from about 7.0 to about 13.0, wherein the amount of alcohol is inversely proportional to the pH of the composition.

METHOD AND COMPOSITIONS FOR DISINFECTING HARD SURFACES

FIELD OF THE INVENTION

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The present invention is directed to methods and compositions for the treatment of hard surfaces, including the disinfecting and/or sanitizing of such hard surfaces. The compositions of the invention can be used on hard non-porous surfaces.

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BACKGROUND OF THE INVENTION

Microorganisms can usually be categorized into several general groups according to the innate resistance levels to a spectrum of physical or chemical germicidal agents (Manual of Clinical Microbiology, 5th edition, ed. A. Balows, ASM Press, Washington, D.C., p. 185 (1991). In order of decreasing resistance to germicidal agents the broad groups include: Bacterial spores > Mycobacteria (e.g. *Mycobacterium tuberculosis var. bovis*) > Nonlipid or small viruses (e.g. poliovirus, coxsackie virus), Fungi (e.g. *Trichophyton* sp., *Candida* sp.) > Vegetative bacteria (e.g. *Staphylococcus aureus*, *Salmonella choleraesuis*) > Lipid viruses (e.g. herpes simplex, HIV). From this scheme it can be presumed that activity against the more resistant organisms (e.g. *Mycobacterium tuberculosis var. bovis*, poliovirus) implies activity against the less resistant organisms (e.g. vegetative bacteria, lipid viruses).

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It is generally known that ethanol can kill resistant organisms such as *Mycobacterium tuberculosis var. bovis* and poliovirus, but that high concentrations are needed (e.g. 70-90%). (*Disinfection, Sterilization, and Preservation*, Seymour S. Block, Lea & Febiger, Philadelphia, p. 197 (1991)) Prior studies have shown that ethanol, in concentrations of 63-70%, had little virucidal action against poliovirus. Other studies showed that a minimum concentration of 70% was required to inactivate this virus. This poses an environmental problem. There is substantial interest on the part of

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governmental regulators to reduce VOC (volatile organic compounds). For example, at one time, the California Air Resource Board suggested that the VOC for disinfectant spray compositions be less than 60 weight percent.

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In United States Patent 5,180,749, there is disclosed an antimicrobial composition that includes up to only about 30 percent by weight ethanol. This compositions also includes however, another active ingredient which is also a VOC, benzyl alcohol. Other references also show the use of relatively low
10 (e.g. about 50% by weight ethanol) but these compositions also include other active components, typically VOC. These other active components often are undesirable for a number of reasons, one of which is cost as well as a lack of efficacy against highly resistant organisms (e.g. poliovirus).

15 Thus, there is a continuing need for low VOC disinfecting methods and compositions.

SUMMARY OF THE INVENTION

20 In accordance with the present invention, there is disclosed a method for disinfecting and/or sanitizing a hard surface comprising the step of treating said surface with an aqueous composition comprising an alcohol selected from the group consisting of methanol, ethanol, n-propanol, isopropanol, n-butanol, benzyl alcohol, and mixtures thereof which is present in an amount of
25 from about 40 and 70 weight percent; an effective amount of a pH modifying agent such that the pH range of the composition is from about 7.0 to about 13.0, wherein the amount of alcohol in the composition is inversely proportional to the pH of the composition; optionally, a component selected from the group consisting of antimicrobials, corrosion inhibitors, perfumes,
30 perfume carriers, solvents, surfactants, propellants, pH buffers, fungicides, film-forming polymers, and anti-oxidants; and water, to 100 weight percent.

In certain preferred embodiments, the compositions used in the method also include tetrasodium ethylenediaminetetraacetate (Na_4EDTA) as a pH modifier. In other preferred embodiments, the alcohol is preferably ethanol which is present in an amount of from about 50 to about 70 weight percent and in more preferable embodiments, the level of alcohol is present in an amount of from about 60 to about 70 weight percent. Preferably, the pH range is from about 9 to about 12, more preferably from about 10 to 12. Preferably, the composition is in an aerosol form but non-aerosol forms are also contemplated.

Also in accordance with the present invention, there is disclosed a composition for sanitizing and/or disinfecting a hard surface comprising an alcohol selected from the group consisting of methanol, ethanol, n-propanol, isopropanol, n-butanol, benzyl alcohol, and mixtures thereof which is present in an amount of from about 40 to about 70 weight percent; an effective amount of a pH modifying agent such that the pH range of the composition is from about 7.0 to about 13.0, wherein the amount of alcohol is inversely proportionally to the pH of the composition; optionally, a component selected from the group consisting of antimicrobials, corrosion inhibitors, perfumes, perfume carriers, solvents, surfactants, propellants, pH buffers, fungicides, film-forming polymers, and anti-oxidants; and water, to 100 weight percent.

In certain preferred embodiments, the compositions include Na_4EDTA . In other preferred embodiments, the alcohol is preferably ethanol which is present in an amount of from about 50 to about 70 weight percent and in more preferable embodiments, the level of alcohol is from about 60 to about 70 weight percent. Preferably, the pH range is from about 9 to 12, more preferably from about 10 to 12. Preferably, the composition is in an aerosol form but non-aerosol forms are also contemplated.

BRIEF DESCRIPTION OF THE DRAWING

Figure 1 shows the efficacy of different formulations of ethanol and Na₄EDTA (1.5% Na₄EDTA solution is 0.56% EDTA adjusted to pH with sodium citrate) at various pH levels against poliovirus type 1. The legend for Figure 1 is as follows:

	0% EtOH		60% EtOH / 1.5% Na ₄ EDTA
	45% EtOH / 1.5% Na ₄ EDTA		65% EtOH / 1.5% Na ₄ EDTA
	55% EtOH / 1.5% Na ₄ EDTA		70% EtOH / 1.5% Na ₄ EDTA

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DETAILED DESCRIPTION OF THE INVENTION

In accordance with the present invention, there is disclosed a method for sanitizing and/or disinfecting a hard a surface comprising the step of treating said surface with an aqueous composition comprising an alcohol selected from the group consisting of methanol, ethanol, n-propanol, isopropanol, n-butanol, benzyl alcohol, and mixtures thereof which is present in an amount of from about 40 and 70 weight percent; an effective amount of a pH modifying agent such that the pH range of the composition is from about 7.0 to about 13.0, wherein the amount of alcohol is inversely proportional to the pH of the composition; optionally, a component selected from the group consisting of antimicrobials, corrosion inhibitors, perfumes, perfume carriers, solvents, surfactants, propellants, pH buffers, fungicides, film-forming polymers, and anti-oxidants; and water, to 100 weight percent.

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In certain preferred embodiments, the compositions used in the method also include Na₄EDTA as a pH modifier. In other preferred embodiments, the alcohol is preferably ethanol which is present in an amount of from about 50 to about 70 weight percent and in more preferably embodiments, the level of

alcohol is present in an amount of from about 60 to about 70 weight percent. Preferably, the pH range is from about 9 to about 12, more preferably from about 10 to about 12. Preferably, the composition is in an aerosol form but
5 non-aerosol forms are also contemplated.

Also in accordance with the present invention, there is disclosed a composition for sanitizing and/or disinfecting a hard surface comprising an alcohol selected from the group consisting of methanol, ethanol, n-propanol,
10 isopropanol, n-butanol, benzyl alcohol, and mixtures thereof which is present in an amount of from about 40 to about 70 weight percent; an effective amount of a pH modifying agent such that the pH range of the composition is from about 7.0 to about 13.0, wherein the amount of alcohol is inversely proportional to the pH of the composition; optionally, a component selected
15 from the group consisting of antimicrobials, corrosion inhibitors, perfumes, perfume carriers, solvents, surfactants, propellants, pH buffers, fungicides, film-forming polymers, and anti-oxidants; and water, to 100 weight percent.

In certain preferred embodiments, the compositions include Na₄EDTA.
20 In other preferred embodiments, the alcohol is preferably ethanol which is present in an amount of from about 50 to about 70 weight percent and in more preferable embodiments, the level of alcohol is present in an amount of from about 60 to 70 weight percent. Preferably, the pH range is from about 9 to about 12, more preferably from about 10 to about 12. Preferably, the
25 composition is in an aerosol form but non-aerosol forms are also contemplated.

In accordance with the present invention, the alcohol containing aqueous composition has a pH in the range of from about 7.0 to about 13.0.
30 The pH can be adjusted to the desired level using one or more suitable bases. In this regard, the inventors have found an inverse relationship between the alcohol level and the pH. The pH at which the formulations are effective depends on the alcohol level. The inventors have found that, for example, a

45% ethanol formulation is effective against poliovirus at a pH of 11.5 or greater. Similar efficacy is found with a 65% ethanol formulation at a pH of about 7.0. Thus, the higher the pH, the lower amount of alcohol, or the lower
5 the pH, the higher amount of alcohol, is needed for compositions of the present invention.

Useful bases include, for example, alkali metal hydroxides such as lithium, sodium, potassium and calcium hydroxide; ammonium hydroxide;
10 Na_4EDTA ; tri- or tetraammonium ethylenediaminetetraacetate (ammonium EDTA); and tri- or tetrapotassium ethylenediaminetetraacetate (potassium EDTA). Alkali metal or hydrogen carbonates such as sodium carbonate or sodium hydrogen carbonate and alkali metal salts of borates or phosphates can also be used either alone, mixtures thereof, or in conjunction with the
15 aforementioned bases.

As noted, it is preferred that the compositions contain significant amounts of Na_4EDTA to adjust the pH although other compounds can also contribute to the pH adjustment. As used in the present invention, amounts
20 from about 0.1 to about 2.0 are useful. Na_4EDTA is commercially available under the tradenames Versene® 100LN from Dow Chemical and Dissolvine® E-39 from Akzo Nobel. Other salts of EDTA, such as tri- or tetrapotassium EDTA or tri- or tetraammonium EDTA, as well as mixtures thereof, can also be used to adjust the pH of the compositions. Tri- or tetrapotassium EDTA or
25 tri- or tetraammonium EDTA are also available under the Dissolvine® tradename.

As will be seen in the comparative examples which follow, it is surprising that the alcohol containing compositions having a pH range from
30 about 7.0 to about 13.0 provide such effectiveness against poliovirus and other difficult pathogens since high pH solution alone do not provide this effect.

The alcohol used in the inventive compositions is generally present in an amount of from about 40 to about 70 weight percent of the composition, preferably from about 50 to about 70 weight percent and in more preferably
5 embodiments, the level of alcohol is present in an amount from about 60 to about 70 weight percent. The alcohol used in the inventive compositions can be methanol, ethanol, n-propanol, isopropanol, n-butanol, benzyl alcohol, or mixtures thereof.

10 The major component of the compositions used in the invention is water, the concentration of which, based on the total weight of the three essential ingredients, ranges from about 30 to about 55 weight percent.

One or more other ingredients may optionally be included in the
15 compositions in order to provide aesthetic or other beneficial properties thereto. Such optional ingredients are, for example, additional antimicrobial agents, deodorizers, emulsifiers, solubilizers, corrosion inhibitors when the compositions are packaged in metal containers, e.g., aerosol containers, perfumes, perfume carriers, surfactants, propellants, pH buffers, fungicides,
20 film-forming polymers, and anti-oxidants and solvents, the only requirement being that for any particular composition such optional ingredients be compatible with the other ingredients present therein.

By way of example, optional ingredients which may be incorporated
25 include the following:

Antimicrobials (also known as antibacterials) - phenolic compounds such as o-phenylphenol, o-benzyl-p-chlorophenol and 4-tert-amylphenol; and quaternary ammonium compounds such as alkyl dimethyl benzyl ammonium
30 chloride, octyl decyl dimethyl ammonium chloride, dioctyl dimethyl ammonium chloride, didecyl dimethyl ammonium chloride and alkyl dimethyl benzyl ammonium saccharinate. Other useful antibacterial agents include those

described in United States patent numbers 3,835,057 and 4,714,563.

Particular antibacterials that are useful include:

- 5 2, 6-dimethyl-4-hydroxychlorobenzene; 3,4,4'-trichlorocarbanilide; 3-trifluoromethyl-4,4'-dichlorocarbanilide; 2, 2'-dihydroxy-3,3',5,5',6,6'-hexachlorodiphenylmethane; 2, 2'-dihydroxy-3,3',5,5'-tetrachlorodiphenylmethane; 2, 2'-dihydroxy-3, 3'-dibromo-5,5'-dichlorodiphenylmethane; 2-hydroxy-4,4'-dichlorodiphenylether; 2-hydroxy-10 3,5',4-tribromodiphenylether; and 1-hydroxy-4-methyl-6-(2.4.4-trimethylpentyl)-2(1H)pyridinone. Other antibacterials are available under the BARDAC®, BARQUAT®, HYAMINE®, LONZABAC®, BTC®, and ONYXIDE® trademarks, which are more fully described in, for example, *McCutcheon's Functional Materials* (Vol. 2), North American Edition, 2000, and the
15 respective product literature from the respective suppliers - Lonza (BARDAC, BARQUAT, HYAMINE, LONZABAC) and Stepan Chemical (BTC and ONYXIDE).

A preferred antibacterial agent is Onyxide® 3300. This is a non-
20 chloride ion containing quaternary ammonium antimicrobial that is less corrosive than typical halogen based quaternary ammonium compounds. When added to the inventive compositions, the additional antimicrobial agent is generally present in an amount of from about 0.01 to about 0.10 weight percent of the composition, preferably from about 0.05 to about 0.075 weight
25 percent.

Deodorizer - N-alkyl-N-ethylmorpholinium ethyl sulfate.

Corrosion Inhibitor - mono - and triethanolamine, ammonium
30 hydroxide, sodium molybdate and sodium benzoate, borates, silicates, as well as other corrosion inhibitors well known to those of ordinary skill in the art. The corrosion inhibitor, when needed, is generally present in an amount of from about 0.02 to about 0.50 weight percent of the composition, preferably

from about 0.05 to about 0.10 weight percent. Those of ordinary skill in the art will appreciate that if compositions of the present invention are prepared in a non-aerosol system, corrosion inhibitors will not be necessary when such compositions are placed in plastic bottles with trigger pumps sprays or squirt-type dispensers or impregnated into towelettes.

Solvent - alcohols such as isopropyl alcohol and butyl alcohol; glycols such as propylene glycol triethylene glycol and the like; each of which can also contribute to antimicrobial activity. The glycols are particularly useful in air sanitizer embodiments.

Where guidance is not given above, the amount of the optional components can readily be determined by one skilled in the art.

The compositions used in the invention can contain small amounts of surfactant to improve surface wetting and to improve evenness of contact. These surfactants when used for this purpose are present in low amounts, for example, up to about 0.5 percent by weight.

Examples of surfactants include:

(1) alkyl sulfonates and sulfates wherein the alkyl is straight or branched and has from about 8 to about 24 carbon atoms and the cation is water-soluble, e.g., alkali metal and ammonium;

(2 (preferred)) fluorinated surfactants such as, for example, anionic, nonionic, cationic and amphoteric fluorosurfactants marketed by E. I. DuPont de Nemours and Company under the trademark ZONYL® e. g. ZONYL® FSK, an amphoteric fluorosurfactant, ZONYL® FSN and ZONYL® FSO, fluorosurfactants, ZONYL® FSJ, an anionic fluorosurfactant and ZONYL® FSC and ZONYL® FSD, cationic fluorosurfactants; as well as fluorosurfactants marketed by The 3M Corporation under the FLUORAD® mark such as Fluorad® FC-171 (a nonionic fluorosurfactant), Fluorad® FC-

135 (a cationic surfactant), Fluorad® FC-740 (generally described to be fluorinated alkyl esters), Fluorad® FC-430 (generally described to be fluorinated alkyl esters), Fluorad® FC-431 (generally described to be fluorinated alkyl esters), and, Fluorad® FC-I 70-C (generally described as being fluorinated alkyl polyoxyethylene ethanols);

(3) alkali metal salts of alkylbenzene and alkyl toluene sulfonic acids where alkyl has from about 9 to about 15 carbon atoms;

(4) alkali metal and amine, e.g. an ethanolamine, salts of mono- and di-alkyl esters of sulfosuccinic acid where alkyl can be straight or branched and has from 7 to 30 carbon atoms;

(5) alkali metal or ammonium salts of the reaction product of C8 to C22 alcohols and ethylene oxide. Specific useful surfactants include those described in WO 92/18100, namely ammonium laureth sulfate; parent-15-7 carboxylic acid; TEA-oleamido PEG-n sulfosuccinate; and PPG-5-ceteth-10 phosphate;

(6) lauryl sulfates; oleyl succinates; lauryl ether sulfates; dodecylbenzene sulfonates; and N-lauroyl sarcosinate. The usual counter ion is sodium, ammonium or ethanolamines such as mono and triethanolamine;

(7) aminocarboxylic and aminosulfonic acids and salts thereof such as alkali metal 3-(dodecylamino) propionate and alkali metal 3-(dodecylamino) propane-1-sulfonate; and alkyl and alkylamido betaines such as cocamidopropyl betaine;

(8) C₁₂-C₁₅ linear primary alcohol ethoxylates [more preferably, a C₁₂₋₁₅ linear primary ethoxylate have 7 moles EO (ethylene oxide) per mole of alcohol, as commercially available under the trademark NEODOL™ 25-7 supplied by Shell Chemical Company, Houston, Texas]

The compositions of the invention may be formulated with conventional propellants for dispensing as aerosols from conventional pressurized containers. Propellants which may be used are well known and conventional
5 in the art and include, for example, a hydrocarbon, of from 1 to 10 carbon atoms, such as n-propane, n-butane, isobutane, n-pentane, isopentane, and mixtures thereof; dimethyl ether and blends thereof as well as individual or mixtures of chlorofluoro- and/or fluorohydrocarbons- and/or hydrochlorofluorocarbons (HCFCs). Useful commercially available
10 compositions include A-70 (Aerosol compositions with a vapor pressure of 70 psig available from companies such as Diversified and Aeropress.) Compressed gases such as carbon dioxide, compressed air, nitrogen, and possibly dense or supercritical fluids may also be used.

15 The amount of propellant employed should provide a suitable spray pattern and for essentially complete expulsion of the composition from the aerosol container. The appropriate amount to be used for any particular aerosol propellant system can readily be determined by one skilled in the art. Preferably, the propellants comprise about 1% to about 50% of the aerosol
20 formulation with preferred amounts being from about 2% to about 25%, more preferably from about 5% to about 15%. Generally speaking, the amount of a particular propellant employed should provide an internal pressure of from about 20 to about 150 psig at 70 F.

25 The compositions can be packaged in conventional, ready-to-use dispensing systems. Thus they can be packaged in aerosol form in conventional aerosol containers or in liquid form in non-aerosol trigger pumps spray bottles and squeeze bottles made from traditional and usual plastic materials such as polypropylene, polyethylene, and the like. They can also be
30 impregnated into towelettes and packaged individually or packaged in bulk form for individual dispensing. The types of trigger pump spray bottles, squeeze bottles, and towelettes are well known to those of ordinary skill in the art.

The compositions can be prepared by entirely conventional procedures, no special techniques being required.

- 5 The following examples are presented for a further understanding of the invention. The data shown in Tables 1 through 5 show various embodiments of the present invention. Table 1 shows poliovirus inactivation at various levels of alcohol and pH; Table 2 shows poliovirus inactivation at zero level alcohol at various pH; Tables 3A, 3B, and 3C show poliovirus
- 10 inactivation at various alcohol levels at pH 7.0, 8.0, and 10.0, respectively; and Table 4 shows disinfection activity at various alcohol levels and pH.

Table 1	Ex.1	Ex.2	Ex.3	Ex.4	Ex.5	Ex.6	Ex.7	Ex.8
Ethyl alcohol	45.00	45.00	45.00	45.00	45.00	55.00	55.00	55.00
Na ₄ EDTA (38%)	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Citric acid (50%)	0.11	0.08	0.06	0.04	0.03	0.35	0.24	0.20
Deionized water	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.
pH	9.5	10.0	10.5	11.0	11.5	7.0	8.0	8.5
Poliovirus log reduction	0.00	1.00	1.00	1.00	3.00	0.88	0.50	2.88

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Table 1 (cont'd)	Ex.9	Ex.10	Ex.11	Ex.12	Ex.13	Ex.14	Ex.15	Ex.16
Ethyl alcohol	55.00	55.00	55.00	60.00	60.00	65.00	65.00	70.00
Na ₄ EDTA (38%)	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Citric acid (50%)	0.15	0.10	0.08	0.22	0.29	0.24	0.37	0.39
Deionized water	q.s.	q.s.		q.s.	q.s.	q.s.	q.s.	q.s.
pH	9.0	9.5	10.0	7.5	8.0	7.0	8.0	7.0
Poliovirus log reduction	4.50	4.17	4.88	1.33	2.00	2.33	2.67	4.67

Table 2	Ex.17	Ex.18	Ex.19
Ethyl alcohol	—	—	—
Na ₄ EDTA (38%)	1.50	1.50	1.50
Citric acid (50%)	0.29	0.14	—
Deionized water	q.s.	q.s.	q.s.
pH	7.0	10.0	11.5
Poliovirus log reduction	0.00	0.00	0.05

Table 3A	Ex.20	Ex.21	Ex.22	Ex.23
Ethyl alcohol	—	55.00	65.00	70.00
Na ₄ EDTA (38%)	1.50	1.50	1.50	1.50
Citric acid (50%)	0.29	0.35	0.24	0.39
Deionized water	q.s.	q.s.	q.s.	q.s.
pH	7.0	7.0	7.0	7.0
Poliovirus log reduction	0.00	0.88	2.33	4.67

Table 3B	Ex.24	Ex.25	Ex.26
Ethyl alcohol	55.00	60.00	65.00
Na ₄ EDTA (38%)	1.50	1.50	1.50
Citric acid (50%)	0.24	0.29	0.37
Deionized water	q.s.	q.s.	q.s.
pH	8.0	8.0	8.0
Poliovirus log reduction	0.50	2.00	2.67

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Table 3C	Ex.27	Ex.28	Ex.29
Ethyl alcohol	—	45.00	55.00
Na ₄ EDTA (38%)	1.50	1.50	1.50
Citric acid (50%)	0.14	0.08	0.08
Deionized water	q.s.	q.s.	q.s.
pH	10.0	10.0	10.0
Poliovirus log reduction	0.00	1.00	4.88

Table 4	Ex.30	Ex.31	Ex.32	Ex.33
Ethyl alcohol	60.000	60.000	56.500	55.000
Onyxide® 3300**	--	0.100	0.050	0.50
Corrosion Inhibitor	0.099	0.099	0.097	0.100
Na ₄ EDTA (38%)	1.482	1.482	1.488	1.900
Fragrance	0.225	0.225	--	--
Ammonium hydroxide (28%)	0.247	0.247	0.193	0.190
Propellant	1.200	1.200	3.500	5.000
Deionized water	q.s.	q.s.	q.s.	q.s.
pH	10.4	10.6	10.2	10.8
Poliovirus log reduction	6.00	N.E.	N.E.	5.50
<i>Staphylococcus aureus</i> survival	0/60*	0/20*	N.E.	N.E.
<i>Pseudomonas aeruginosa</i> survival	0/60*	0/20*	N.E.	N.E.
<i>M. smegmatis</i> survival	0/15*	N.E.	N.E.	N.E.
<i>Salmonella choleraesuis</i>	N.E.	0/20*	N.E.	N.E.
<i>Mycobacterium terrae</i>	N.E.	N.E.	0/20*	0/20*

* number of positive plates/number of tested plates

N.E. not evaluated

10 ** alkyl dimethyl benzyl ammonium saccharinate (33%)

Other exemplary compositions which are contemplated under the present invention and which have activity against a variety of organisms are shown in Tables 5A to 5H shown below.

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Table 5A	Ex.34	Ex.35	Ex.36	Ex.37
Anhydrous Ethanol	12.930	50.850	20.000	20.000
Isopropanol	50.850	12.930	20.000	20.000
Ammonium Hydroxide 28%	0.032	0.018	0.020	0.020
D.I. WATER	36.220	36.220	60.000	60.000
Propellant present (Y/N)	N	N	N	N
pH	11.96	9.07	8.57	8.68

Table 5B	Ex.38	Ex.39	Ex.40	Ex.41
Anhydrous Ethanol	12.930	20.000	20.000	50.850
Isopropanol	50.850	20.000	20.000	12.930
Ammonium Hydroxide 28%	0.002	0.036	0.028	0.330
D.I. WATER	36.220	60.000	60.000	36.220
Propellant present (Y/N)	N	N	N	N
pH	9.82	10.51	10.26	11.10

Table 5C	Ex.42	Ex.43	Ex.44	Ex.45	Ex.46	Ex.47
Anhydrous Ethanol	40.000	20.000	40.000	20.000	20.000	40.000
Isopropanol		20.000	40.000	20.000	20.000	0.000
EDTA 38%	qs pH	qs pH	qs pH	qs pH	qs pH	qs pH
D.I. WATER	60.000	60.000	20.000	60.000	60.000	60.000
Propellant present (Y/N)	N	N	N	N	N	N
pH	10.20	10.25	10.25	10.27	7.96	10.30

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Table 5D	Ex.48	Ex.49	Ex.50	Ex.51	Ex.52
Anhydrous Ethanol	20.000	12.930	50.850	20.000	20.000
Isopropanol	20.000	50.850	12.930	20.000	20.000
EDTA 38%	qs pH	qs pH	qs pH	qs pH	qs pH
D.I. WATER	60.000	36.220	36.220	60.000	60.000
Propellant present (Y/N)	N	N	N	N	N
pH	12.46	11.46	9.06	10.20	10.15

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Table 5E	Ex.53	Ex.54	Ex.55	Ex.56
Anhydrous Ethanol	24.000	60.000	40.000	36.000
Isopropanol	16.000	0.000	0.000	24.000
Sodium Hydroxide 1N	qs pH	qs pH	qs pH	qs pH
D.I. WATER	60.000	40.000	60.000	40.000
Propellant present (Y/N)	N	N	N	N
pH	10.97	11.59	10.99	11.55

Table 5F	Ex.57	Ex.58	Ex.59	Ex.60
Anhydrous Ethanol	60.000	36.000	60.000	40.000
Isopropanol	0.000	24.000	0.000	10.000
Sodium Hydroxide 1N	qs pH	qs pH	qs pH	qs pH
D.I. WATER	40.000	40.000	40.000	50.000
Propellant present (Y/N)	N	N	N	N
pH	11.05	10.45	11.55	10.81

5

Table 5G	Ex.61	Ex.62	Ex.63	Ex.64
Anhydrous Ethanol	50.000	55.000	60.000	65.000
Onyxide 3300 (33%)	0.049	0.049	0.049	0.049
Corrosion Inhibitor	0.140	0.060	0.060	0.060
Sodium benzoate	0.098	0.098	0.098	0.098
Ammonium Hydroxide 28%	0.140	0.140	0.140	0.140
Fragrance -	0.225	0.225	0.225	0.225
D.I. WATER	42.349	37.428	32.428	27.428
Propellant	7.000	7.000	7.000	7.000
pH	10.95	10.96	10.97	10.99

Table 5H	Ex.65	Ex.66	Ex.67	Ex.68
Anhydrous Ethanol	66.000	70.000	58.000	62.000
Onyxide 3300 (33%)	0.049	0.049	0.049	0.049
Corrosion Inhibitor	0.060	0.060	0.060	0.060
Sodium benzoate	0.098	0.098	0.098	0.098
Sodium Hydroxide 1N	0.093	0.093	0.093	0.093
Ammonium Hydroxide 28%	0.093	0.093	0.093	0.093
Fragrance	0.225	0.225	0.225	0.225
D.I. WATER	26.381	22.381	34.382	30.381
Propellant	7.000	7.000	7.000	7.000
pH	11.28	11.31	11.00	11.17

The method for determining the efficacy of various formulations against poliovirus was as follows:

- 5 Poliovirus type 1 (Sabin) virus stocks were propagated in FRhK-4 cells and generally contained approximately $\log_{10} 7.5$ TCID₅₀ per 0.2 ml. For testing, 0.2 ml of virus stock (containing 10% Fetal Bovine Serum (FBS)) was added to 1.8 ml of the formulation tested and allowed to remain at ambient temperature (approximately 20-26 C) for 10 minutes. After the contact time,
- 10 serial tenfold dilutions of virus were carried out in maintenance medium (Earle's Minimal Essential Medium (EMEM) + 2% FBS). Growth media was removed from the wells of 24 well assay plates containing confluent monolayers of FRhK-4 cells and replaced with 2 ml of maintenance medium (EMEM + 2% FBS). A 0.2 ml aliquot of each dilution of virus/test formulation
- 15 was then placed into each of four separate wells of host cells. The assay plates were incubated at 37 C for 7 to 10 days, with media changes every 2 to 4 days. Virus controls were carried out in an identical manner using 1.8 ml of EMEM, in place of the test formulation. Cytotoxicity controls were carried out by utilizing 0.2 ml of EMEM + 10% FBS, in place of the virus stock. Plates
- 20 were scored for characteristic viral cytopathic effect (cellular rounding and degeneration) and TCID₅₀ endpoint titers were determined.

- The method for determining the efficacy of various formulations against the bacteria mentioned above was based on the standard AOAC Germicidal
- 25 Spray Products test or AOAC Tuberculocidal Activity of Disinfectant Spray Products Test. A representative film of target bacteria was dried on a hard, non-porous surface (e.g., glass slide). The treated slides were then treated with the test formulations for a contact time of ten minutes. After exposure, the treated slides were transferred to vessels containing neutralizing media
- 30 and assayed for survivors. Appropriate viability, dried organism population and neutralization controls were conducted.

The invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

CLAIMS

1. A composition for sanitizing and/or disinfecting a hard surface
5 comprising
an alcohol selected from the group consisting of methanol, ethanol, n-propanol, isopropanol, n-butanol, benzyl alcohol, and mixtures thereof which is present in an amount of from about 40 to about 70 weight percent;
an effective amount of a pH modifying agent such that the pH range of
10 the composition is from about 7.0 to about 13.0, wherein the amount of alcohol is inversely proportional to the pH of the composition;
optionally, a component selected from the group consisting of antimicrobials, corrosion inhibitors, perfumes, perfume carriers, solvents, surfactants, propellants, pH buffers, fungicides, film-forming polymers, and
15 anti-oxidants; and
water, to 100 weight percent.
2. The composition according to claim 1 wherein the amount of alcohol is from about 50 to about 70 weight percent.
20
3. The composition according to claim 2 wherein the amount of alcohol is from about 50 to about 60 weight percent.
4. The composition according to claim 2 wherein the pH of the
25 composition is from about 9 to about 12.
5. The composition according to claim 4 wherein the pH of the composition is from about 10 to about 12.
- 30 6. The composition according to claim 3 wherein the pH of the composition is from about 9 to about 12.

7. The composition according to claim 6 wherein the pH of the composition is from about 10 to about 12.
- 5 8. The composition according to preceding claims 1 to 7 wherein the alcohol is selected from ethanol, isopropanol, and mixtures thereof.
9. The composition according to preceding claims 1 to 8 wherein the alcohol is ethanol.
- 10 10. The composition according to preceding claims 1 to 9 which contains a propellant.
11. A method for sanitizing and/or disinfecting a hard surface comprising
15 the step of treating said surface with an aqueous composition comprising an alcohol selected from the group consisting of methanol, ethanol, n-propanol, isopropanol, n-butanol, benzyl alcohol, and mixtures thereof which is present in an amount of from about 40 to about 70 weight percent; an effective amount of a pH modifying agent such that the pH range of the composition is
20 from about 7.0 to about 13.0, wherein the amount of alcohol is inversely proportional to the pH of the composition; optionally, a component selected from the group consisting of antimicrobials, corrosion inhibitors, perfumes, perfume carriers, solvents, surfactants, propellants, pH buffers, fungicides, film-forming polymers, and anti-oxidants; and water, to 100 weight percent.
- 25 12. The method according to claim 11 wherein the amount of alcohol in the composition is from about 50 to about 70 weight percent.
13. The method according to claim 12 wherein the amount of alcohol in the
30 composition is from about 50 to about 60 weight percent.
14. The method according to claim 12 wherein the pH of the composition is from about 9 to about 12.

15. The method according to claim 14 wherein the pH of the composition is from about 10 to about 12.

5 16. The method according to claim 13 wherein the pH of the composition is from about 9 to about 12.

17. The method according to claim 16 wherein the pH of the composition is from about 10 to about 12.

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18. The method according to preceding claims 11 to 17 wherein in the composition the alcohol is selected from ethanol, isopropanol, and mixtures thereof.

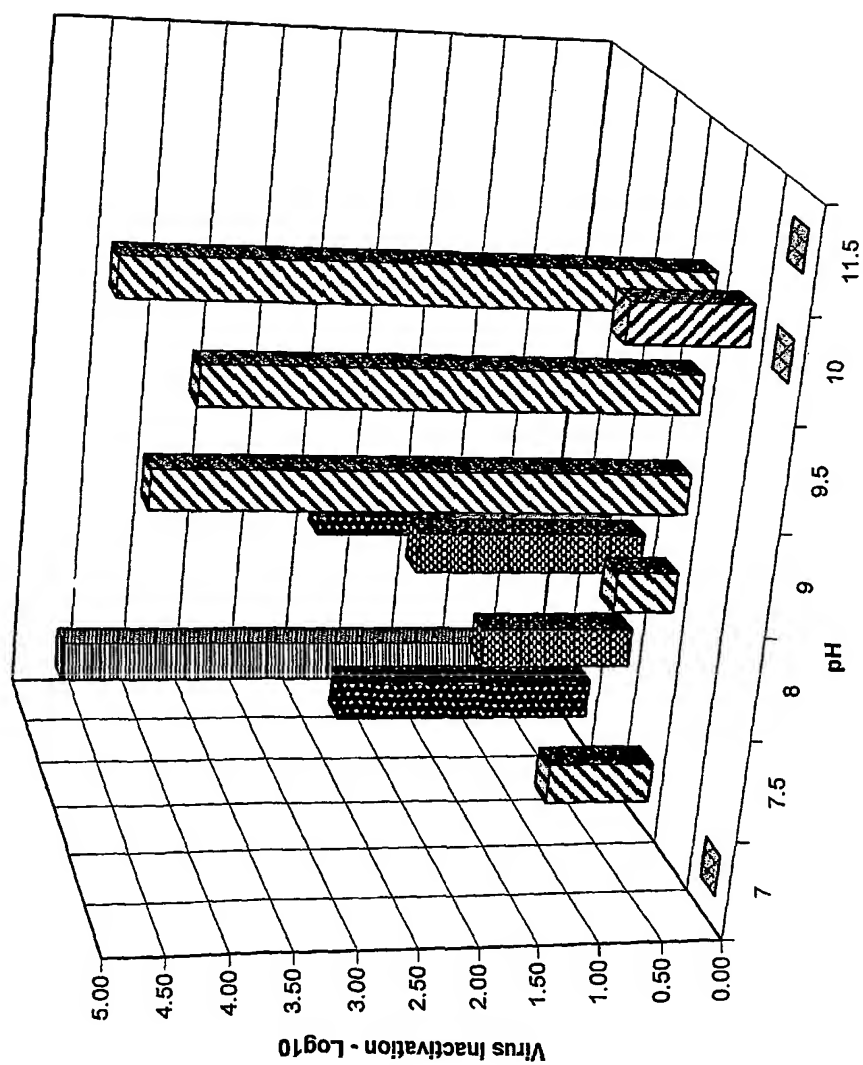
15 19. The method according to preceding claims 11 to 18 wherein in the composition the alcohol is ethanol.

20. The method according to preceding claims 11 to 19 wherein the composition contains a propellant.

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1/1

Figure 1



INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 02/00357

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A01N31/04 A01N31/02 A61L2/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A01N A61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, EPO-Internal, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 848 907 A (BRAUN MEDICAL AG) 24 June 1998 (1998-06-24) page 2, line 39-49 page 3, line 5-35; tables 1-4	1-20
X	US 4 678 658 A (CASEY IRENE ET AL) 7 July 1987 (1987-07-07) column 1, line 46-62 column 2, line 15-29 column 2, line 63 -column 3, line 10; example IV; table 5	1-20
X	EP 0 099 209 A (SURGIKOS INC) 25 January 1984 (1984-01-25) page 2, line 34 -page 3, line 25 page 4, line 22-25 page 5, line 19-35	1,2, 8-12, 18-20
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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P document published prior to the international filing date but later than the priority date claimed

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Z document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 02/00357

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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